Effectiveness Monitoring of Invasive Tamarisk Control

Principal Investigators:

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Matthew Brooks (US Geol Survey, Biol Res Div – Henderson/Yosemite)

Why control Tamarisk?

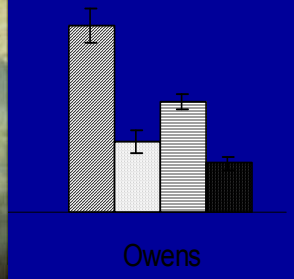
Competes with native plants

Desiccates & salinates soils

High water transpiration

Erosion & sedimentation

Wildfire hazard



birds native
birds tamarisk
species native
species tamarisk

Poor quality habitat

Two decades of tamarisk control & riparian restoration in Clark County springs and rivers

Co-operator treatments: NPS (Curt Deuser), BLM (Tim Rasch, Nora Caplette)

- Hand & mechanical treatments
- Stump & foliar herbicide applications

Do control efforts reduce tamarisk impacts?
Do native vegetation and wildlife recover?
What treatment methods are most effective?

Evaluation of Restoration Treatments: Vegetation responses

Lead: Steve Ostoja (USGS-BRD Bishop)

1. Vegetation surveys in upland seeps and springs (March-June 2009)
   - *Tamarix* spp. control evaluation at 34 unique sites and resulted in 164 plots
   - Plots were randomly located at historic NPS control locations
2. Vegetation (and avian) surveys in floodplain systems (Virgin River) (April-July 2009)
   - In each of 70 BLM sites, two plots were surveyed to evaluate vegetation responses and derive bird-habitat associations

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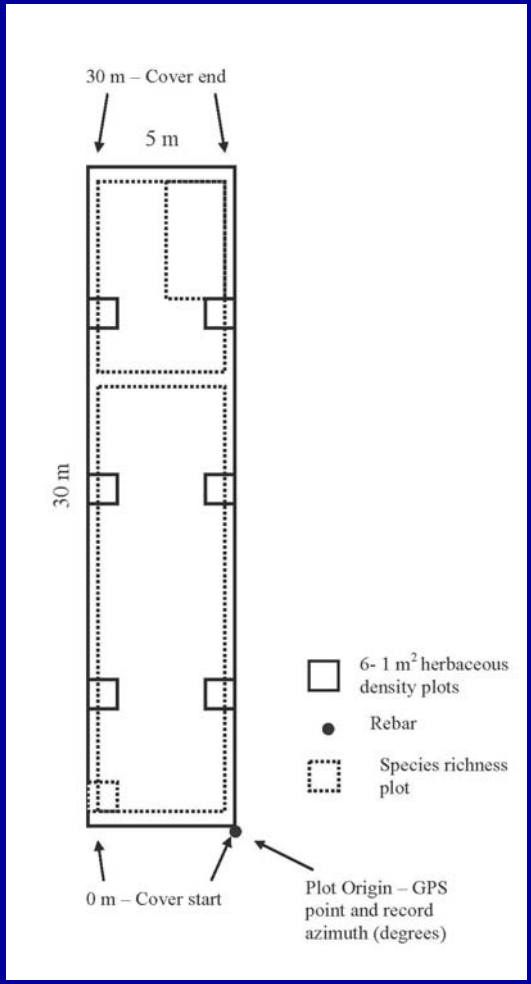
1. Effects of *Tamarix* control on upland seep/spring plant communities



- 30 x 5 m plot

1. Species richness
2. Shrub and tree cover and density
3. Herbaceous species cover and density
4. Nudds board (avian habitat)
5. *Tamarix* condition

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1. Vegetation surveys in upland seeps and springs (preliminary!)

- NPS efforts have effectively re-directed these sites toward communities dominated by native woody or perennial species
- Non-native grasses and forbs are major elements of understory assemblages
- Data analysis & interpretation August - December 2009

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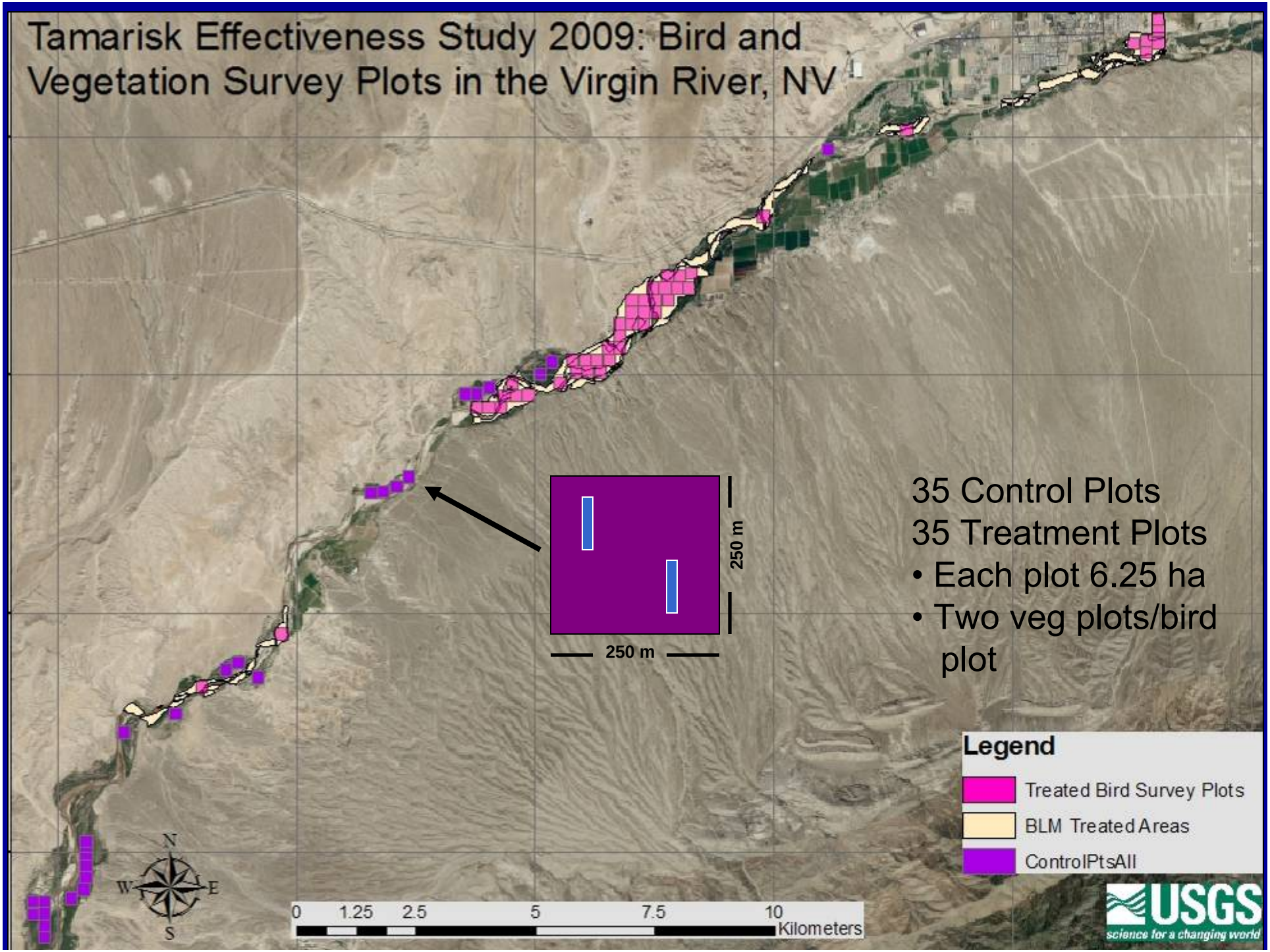
Tamarisk Effectiveness Study 2009: Bird and Vegetation Survey Plots in the Virgin River, NV
250 m
250 m
35 Control Plots
35 Treatment Plots
• Each plot 6.25 ha
• Two veg plots/bird plot
Legend
Treated Bird Survey Plots
BLM Treated Areas
ControlPtsAll
N
W
E
S
0 1.25 2.5 5 7.5 10
Kilometers
USGS
science for a changing world

2. Vegetation in floodplain treatments

- Plant diversity lower than upland spring sites
- BLM mechanical/chemical treatments strongly reduced *Tamarix* live cover
- Soil disturbance leads to secondary invaders (e.g. *Salsola*, *Xanthium, Polypogon) and* *Tamarix* seedlings
- Active restoration was needed: *Prosopis* spp. (mesquites) survived better than Salicaceae (cottonwoods & willows) - partly owing to herbivory

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Effects of Tamarisk control on Bird Communities

Lead: Dr. Susan Roberts (USGS-BRD Fresno)

<u>April – July 2009: Field Data</u>

Field Methods = Spot Mapping

- 8 surveys at each plot
  - 560 surveys total
- Map territories
- Identify species
- Nest searches

<u>Aug – Dec 2009: Analyze Data</u>

Quantify & Compare:

1. Home range size
2. Abundance
3. Species Diversity

T. Munson

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Effects of Tamarisk control on Birds

Preliminary Results:

Species Richness

- Control Plots (>60% Tam cover) = **65 bird species**
- Treatment Plots (<5% Tam cover) = **74 bird species**
- Overlap = 52 species, 9 unique to Controls, 13 unique to treatments

Some birds may just forage or rest in open treatment plots -- real differences will be based on comparing abundance and nesting

G. Tepke

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Saltcedar Control

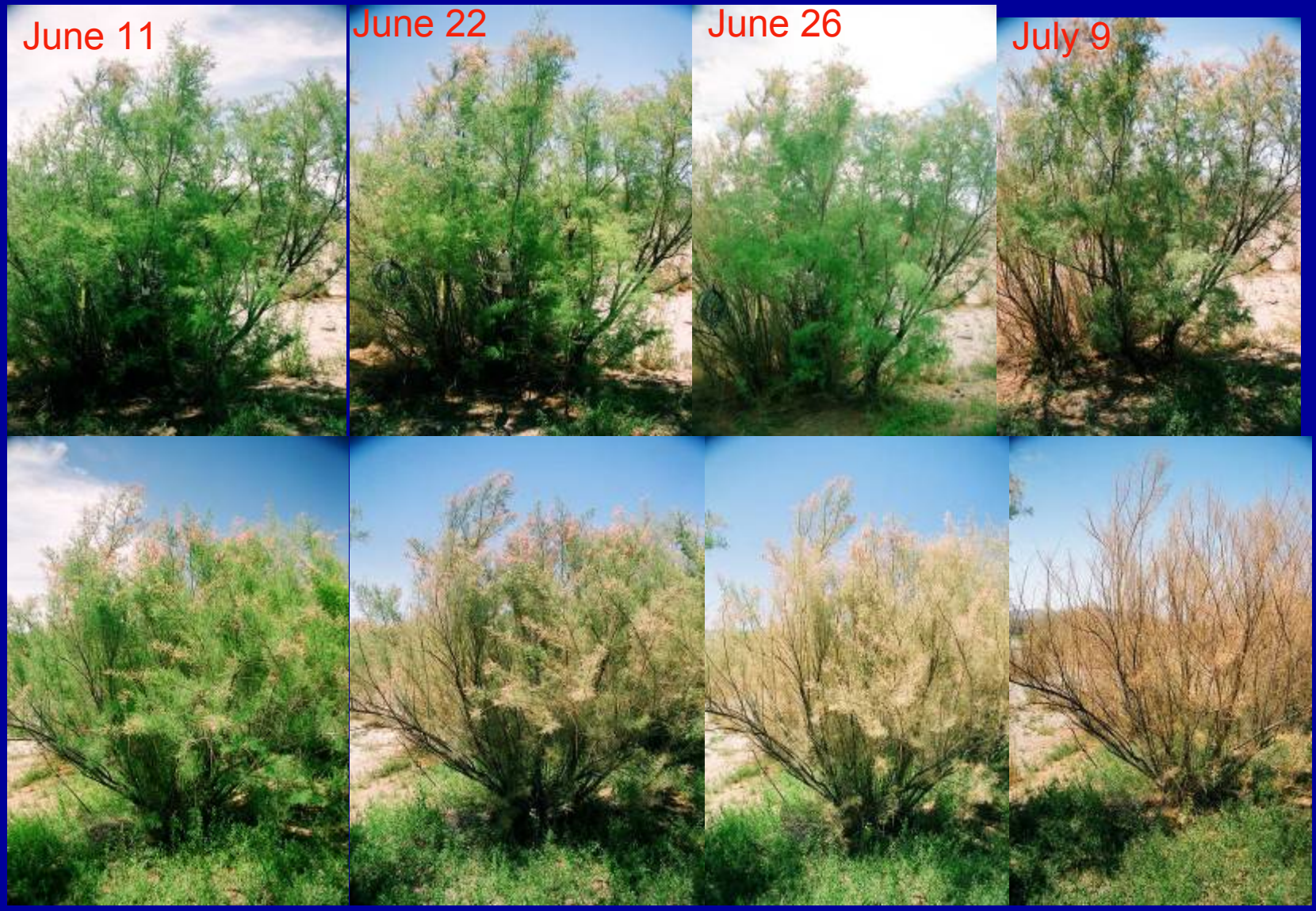
- Mechanical/chemical control:
  Aerial ≥ $400/ha.
  Ground methods = $3,000 to $12,000/ha.
- Temporary, impractical in remote/sensitive habitats
- Classical Biological Control program initiated in 1980's to provide 'safe', sustainable control
- Evaluate potential for tamarisk biocontrol in Clark Co.

Diorhabda elongata (tamarisk leaf beetle) from central Asia
Tested 10 yrs to ensure specificity and safety
Released north of 37 lat. in 2001 – Sevier R., UT; Humboldt, Walker & Truckee R., NV, 7 other states

Paired Plants w/ vs. w/out *Diorhabda*

No

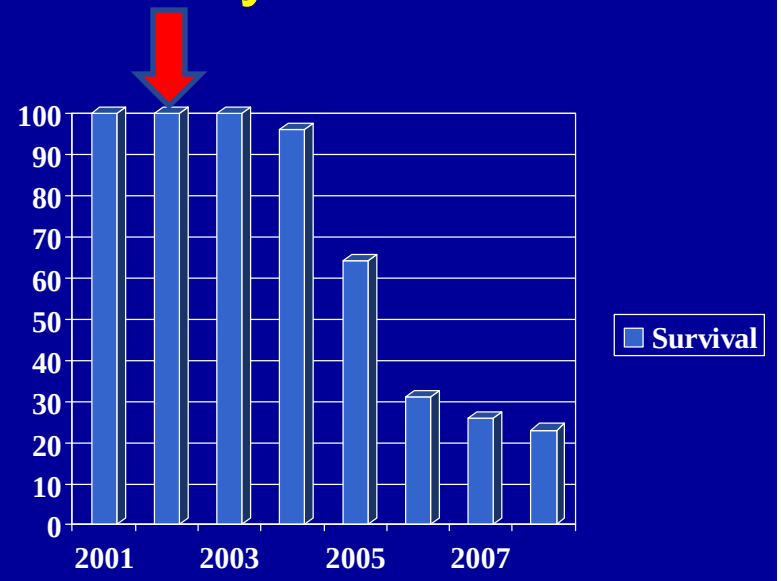
Yes



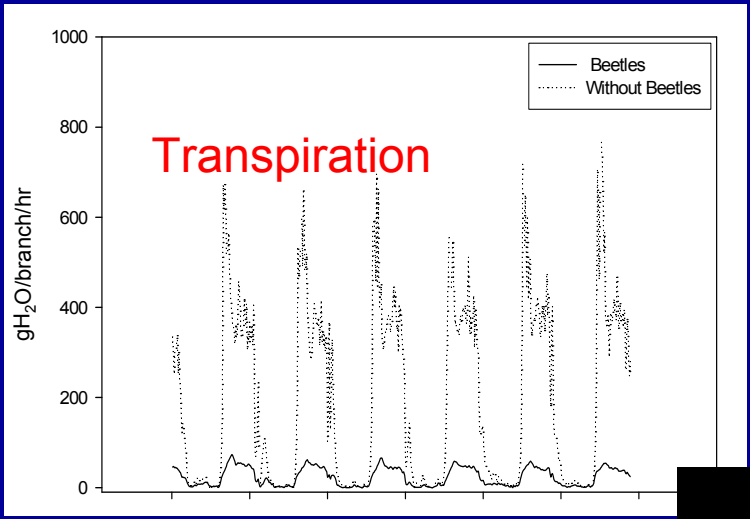
Humboldt Sink, NV

Impact can be Rapid & Dramatic

Re-growth rapid
Dieback gradual &
Mortality slow

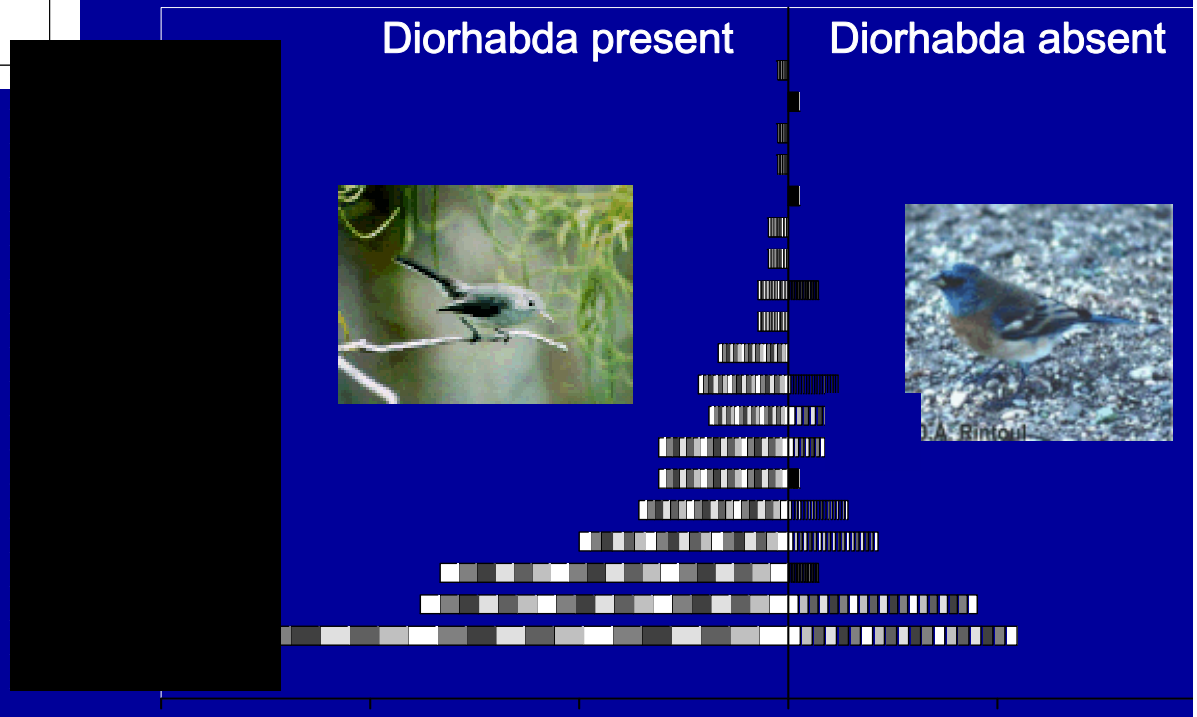


Biocontrol Benefits w/out Mortality



Seasonal water loss to ET reduced 65% Yr 1 >90% Yr 2

Avian Diversity & Abundance increase w/ beetles as food source



Data from Humboldt & Walker Rivers, NV
Pattison et al., Hitchcock et al.

Concerns re: *Tamarix* Biocontrol

- Short-term habitat change with defoliation potentially disrupts wildlife use
- Lawsuit by Center for Biological Diversity centered on Virgin River - Fear SW willow flycatcher impact
- Potential elevated wildfire risk

Defoliation Simulation experiments

Leads: Gail Drus, MeghanTaylor (UCSB)

Low-dose herbicides used to simulate beetle defoliation – Fall ‘08

Track flora, fauna & soil

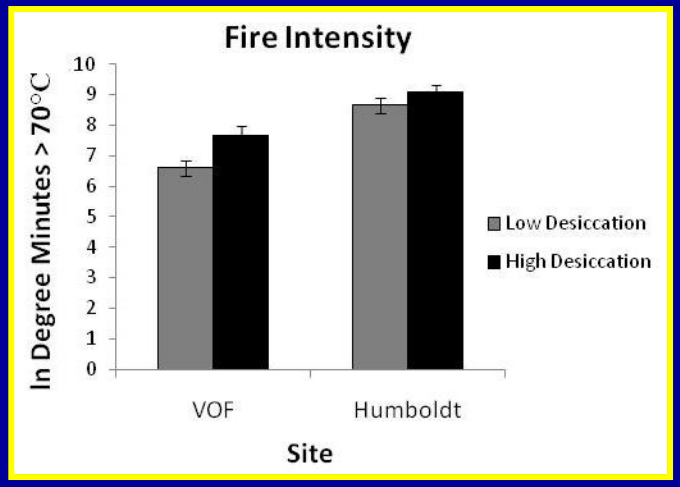
Test fire behavior with prescription burn

Fire behavior: ‘green’ vs. ‘brown foliage

Valley of Fire Wash – Experimental Burn

Foliage desiccation enhanced fire intensity, but only slightly

Thus, fire risk not substantially elevated by biocontrol



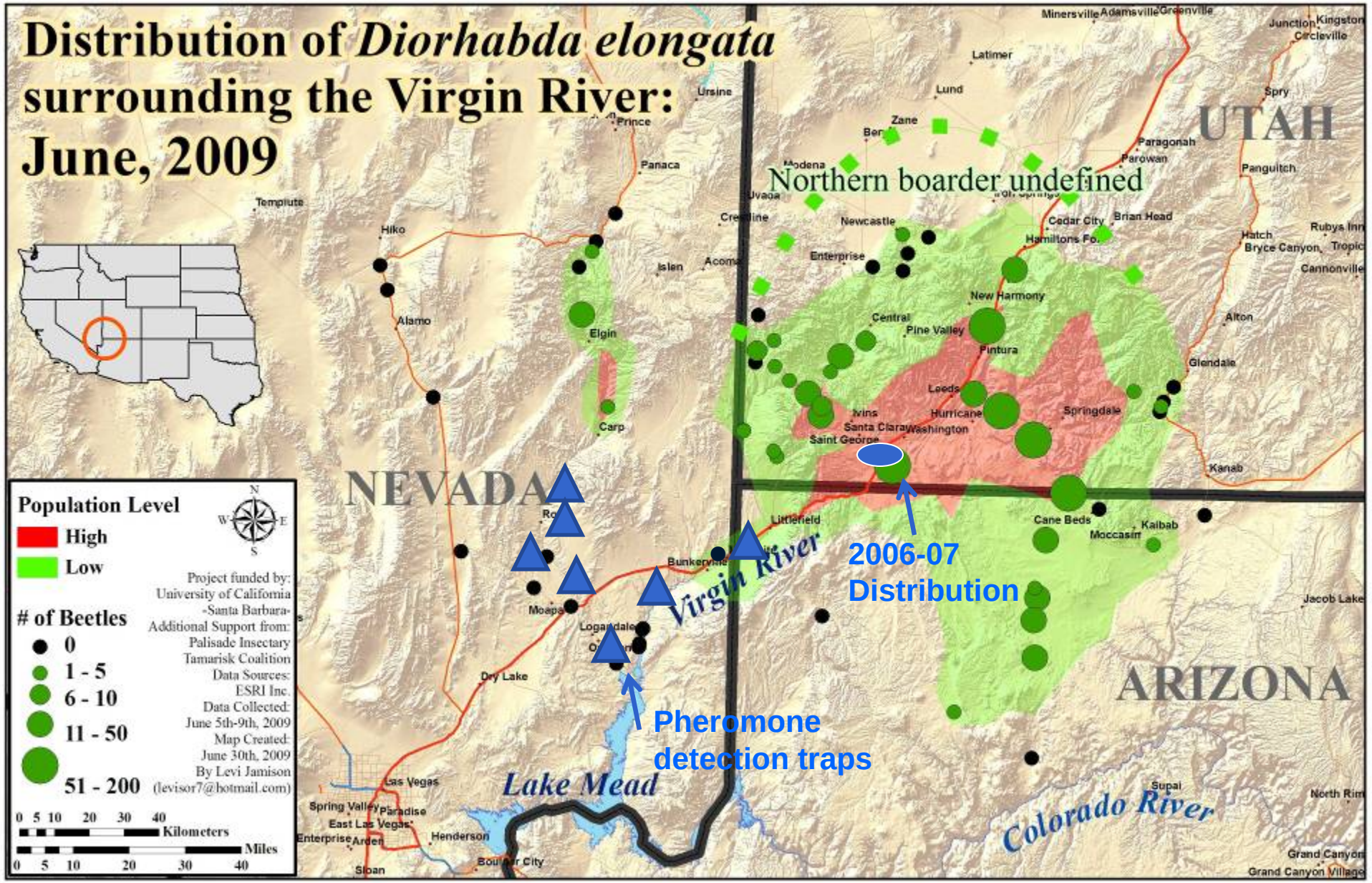
Toquop Wash
July 2009


Diorhabda now in Virgin Watershed
Carp NV
Meadow V. Wash
Washington
2008 Dispersal zone
St George UT
2006-7 Defoliation
2008 Defoliation zone
Beaver Dam Wash
Introduced from Sevier R, UT to St. George by County agents in 2006
Littlefield AZ
Virgin Valley
Mesquite NV
Image © 2008 TerraMetrics

Virgin Gorge - Cedar Pocket:

Colonized 2008

Defoliated 2009



Map prepared by Levi Jamison – Colo Dept Ag, Tamarisk Coalition & UCSB

Virgin Valley nr. Littlefield AZ
July 2009 Defoliation

- May respond to photoperiod and enter diapause early August
- Will over-winter in litter
- Weekly collection for development

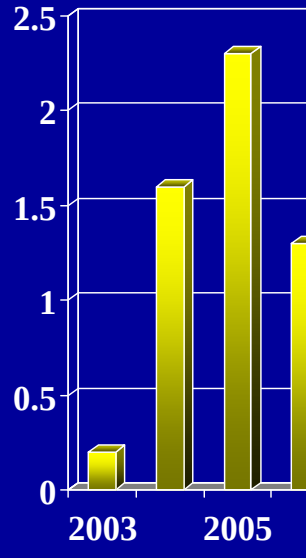
Biocontrol as Tamarisk 'Treatment'

- Implement long-term monitoring (10 yr) to track responses of flora, fauna & physical factors (e.g. soil, water, nutrients, channel form)
- Assess flood & fire risks
- Evaluate/carry out restoration
- Provide objective data for lawsuit
- Outreach to inform public and managers of what the … is going on
- No one else is going to do it, except narrowly focused flycatcher monitoring

Insect Population Monitoring

Track larval and adult stages of *Diorhabda;* Impacts to *Tamarix*

1. Predators can limit establishment
2. May increase with new prey resource



Biocontrol and Herpetofauna

Will native lizards prey on *Diorhabda*?

- Feeding trials -- common lizard species readily consume beetles

Herp response to habitat change

- Compare vegetation architecture before and after leaf beetle establishment
- Mark-recapture data to track abundances
- Relate changes in herp abundance to changes in habitat

Lead: Heather Bateman

Arizona State Univ.

Birds and Tamarisk Lead: Mike Kuehn (UCSB)

Repeated Point Counts and Nest Searches

Mixed Veg (*Prosopis* or *Salix*) vs. Monotypic *Tamarix*
Wet/Mesic (lower terrace) vs. Dry/Xeric (higher terrace)

Common Taxa for Analysis

Lucy's warbler
Yellow warbler
Yellow breasted chat
Bell's vireo
Aberts towhee
Song sparrow
Blue-grey & Black-tailed gnatcatchers
Lazuli & Indigo buntings

Preliminary Relationships

Abundance: WM > WT > DM >> DT
Spp Richness: WM > DM > WT >> DT

WM = Wet/Mixed, WT = Wet/Tamarisk
DM = Dry/Mixed, DT = Dry/Tamarisk

Avian Community Response to Tamarisk BioControl

Short-term effects of beetles

Does defoliation affect nesting success?

Do beetles increase food resources?

Defoliated versus un-defoliated nest sites
-Compare nest concealment and success
-Compare nest microclimate and hatching success
-Compare incubation behavior (film nests)
•Do parents respond behaviorally?

High versus low beetle abundance
-Compare nestling feeding behavior (video)
•Higher feeding rates and nestling growth rates where beetles abundant?

Long-term avian community responses

Do beetles ultimately improve bird habitat?

Tracking changes through time
-Compare avian diversity and abundance between years at monitoring sites
• Greatest change expected in tamarisk-dominant habitats
• Changes linked to increased native veg component?

Need for Restoration

Toquop Wash – wildfire July 2009

Follow-up for Biocontrol
Reduce fire hazard and promote post-fire habitat

Lead: Meghan Taylor (green); Ken Lair

Co-op: Nora Caplette - BLM (orange), Steve Ostoja – USGS (puzzled)

VIP's: John Brekke & Liz Bickmore

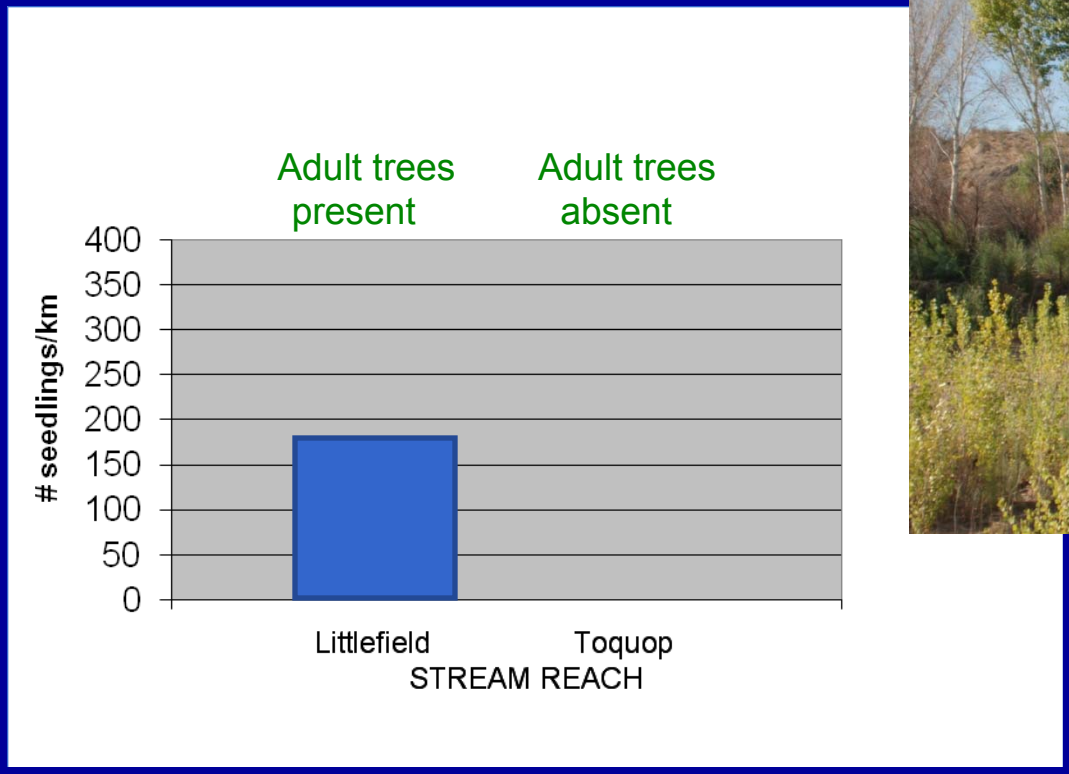
Treatment

	Upland	Riparian
Shallow planting	x	X
Deep planting	x	X
Polymer	x	X
Wattle		X
Pole planting		X
Zeolite column	X	

Repeat Treatments Fall 2009

Riverside Bridge Restoration Site

Evaluate Natural Recruitment of Cottonwood (*Populus fremontii*) Seedlings



Restoration & Recruitment

Hypothesis: Native recovery limited by lack of propagules

- Monitor seedlings & proximity to mature cottonwoods
- Determine spatial dimensions of reproductive plants & 'seed rain'
- Establish propagule "islands" to provide seed for post-flood natural recruitment
- Protect against herbivory - livestock, rabbits, rodents, etc

Use marine recruitment models to determine optimal seed dispersal with minimized effort and expense

Mixed stands/native vegetation

Riverbank surveyed

Restoration sites

Transpiration Evaluation

Before/After Biocontrol – (Ben Conrad – UNLV) same sites of Devitt, Smith et al. in 1990's